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Two Letters about Reactive Electrodynamics and Electromagnetic Antigravity

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Abstract: *An alternative electromagnetic field can carry momentum, therefore one can move by pushing off the field. It is enough to combine the self-action that occurs in an unclosed electric conductor and single-wire electric power transmission.*
***Key Word**: Self-force, Unclosed electric conductor, Single-wire electric current transmission, Conservation of momentum, Alternative electric current, Reactive motion.*

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I. Introduction

In order to move, you need to push off from something. No support – no movement. The rocket is repelled by the gases ejected from nozzle. In magnetic levitation, one magnet is repelled from another. If the body moves uniformly and in straight line, there was still a push.

None of the attempts to compensate the force of gravity with the help of electrical or magnetic system can still be considered successful [1,2]. High hopes were pinned on the EM-drive system [3], but experimental verification did not bring the expected effect [4]. There are problems with the theoretical substantiation of ability to create a significant force due to the interaction of an electromagnetic field with a vacuum [5]. On the other hand, the solution to this problem is already known and undeservedly forgotten. All that remains is to remember three strange and well-known phenomena [6-8] and try to combine them in pursuit of the goal of creating a device that compensates the force of gravity including in empty space.

II. Letter 1. Self-action

In 1986 R. Sigalov and his associates made a *U*-shaped conductor move, through which a direct electric current flows [5]. Experience is not an experiment. The experiment was not long in coming and confirmed that such a system is absolutely correctly described by classical electrodynamics [9], although the law of conservation of momentum remained unconfirmed. Something is wrong here, since the law of conservation of momentum must certainly be valid. The opposite contradicts not only physics, but also common sense.

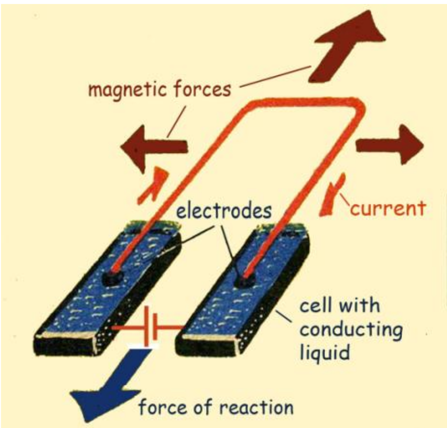

Fig. 1. Self-action

Taking a close look at the magnetic forces, one can find that the movement occurs, formally speaking, under action of the self-force, through which the unclosed conductor acts on itself. Taking into account the magnetic force with which the unclosed conductor acts on the current source with its conductors, one can guess that the sum of all the magnetic forces in the closed system including the unclosed conductor and the current source is strictly zero. Apparently, such a visual interpretation is not enough to find out what actually compensates the force of self-action. With all the desire, without a detailed consideration of all forces, the problem cannot come to a solution.

There are two ways to continue talking about self-action. One of them is to use the finished result [10]. This is the same as referring to the interaction of an electromagnetic field with a vacuum [11]. Not the fact that such an interaction occurs. Better is to consider the magnetic interaction between all the elements that make up the closed electric circuit shown in Fig. 1. It is necessary to suffer, trying to deal with all the magnetic forces with which separate sections of the conductor with current act on others.

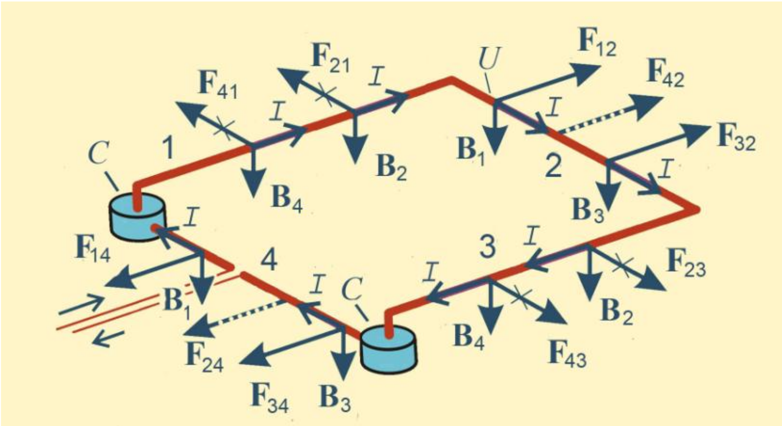

Fig. 2. Self-action in detail.

Too many forces, but some of them compensate each other (Fig. 2). Electric current I flowing in part 1 of conductor U at all points of part 2 produces the magnetic field $\mathbf{B}_1$ perpendicular to the direction of the same current flowing in the rectangular part 2. The Amperian force $\mathbf{F}_{12}$ is directed out the conductor. On the contrary, for the same reason the electric current flowing in the part 2 exerts the force $\mathbf{F}_{21}$ perpendicular to the direction of current in the section 1. Since each of the forces $\mathbf{F}_{21}$ and $\mathbf{F}_{12}$ is transverse with respect to two mutually perpendicular directions of current, then sum of the forces $\mathbf{F}_{21}$ and $\mathbf{F}_{12}$ does not equal to zero. Two parts of one body interact with forces not equal in magnitude and not opposite in direction. The same can be said about the magnetic interaction of sections 2 and 3. Moreover, since the magnetic action of the part 2 on 1 is not much different from the same action of section 2 on the part 3, then the force $\mathbf{F}_{21}$ is equal in magnitude and opposite to the force $\mathbf{F}_{23}$, that means $\mathbf{F}_{21}+\mathbf{F}_{23}=0$.

Electric current in sections 1 and 3 flows in opposite directions. Since the lengths of these sections are assumed to be equal, then these parts are repelled with forces equal in magnitude and opposite in direction and therefore do not contribute the resultant force exerted by the conductor U. The sum $\mathbf{F}_s=\mathbf{F}_{12}+\mathbf{F}_{32}$ is the force by means of which the unclosed conductor U acts on itself. This is nothing else but self-action.

What other forces are acting on this unclosed conductor U? First of all, this is the force $\mathbf{F}_{42}$ with which the section 2 is repelled from the electric current in the part 4, which, together with a bifilar, plays role of a current source. When a distance between these sections is large, this force is negligible small. Electric current flowing in the part 4 exerts the forces $\mathbf{F}_{41}$ and $\mathbf{F}_{43}$ equal in magnitude and opposite in direction. The net force acting on the unclosed conductor, therefore, is $\mathbf{F}_a=\mathbf{F}_{42}$.

Section 4 of current is also repelled from the part 2 creating the force $\mathbf{F}_{24}$ equal in magnitude and opposite in direction to the force $\mathbf{F}_{42}$. Magnetic interaction between both 1→4 and 3→4 are not much different from 1→2 and 3→2 creating forces $\mathbf{F}_{14}$ and $\mathbf{F}_{34}$ equal in magnitude and opposite in direction to the forces $\mathbf{F}_{12}$ and $\mathbf{F}_{32}$. The force of reaction is therefore $\mathbf{F}_r=\mathbf{F}_{24}+\mathbf{F}_{14}+\mathbf{F}_{34}=-\mathbf{F}_{42}-\mathbf{F}_{12}-\mathbf{F}_{32}$. The conclusion is quite simple: $\mathbf{F}_a+\mathbf{F}_r+\mathbf{F}_s=0$. In other words, the sum of all forces acting in a closed system is strictly equal to zero, the law of conservation of momentum is fulfilled, one cannot say anything else. Without such a simple presentation, the conversation about self-action would not be complete. Direct electric current cannot flow in an unclosed conductor, but an alternative one can. This is the whole point.

III. Letter 2. Single-wire electric energy transmission.

A long time ago Nikola Tesla connected a large metallic plate *P* with a metal wire *W* to one terminal of the transformer *T* and, so it is believed, made an electric current flow through single wire [7] (Fig. 3). To make sure that the electric current really flows in an unclosed conductor, the famous inventor included a simple transformer T_2 in the circuit.

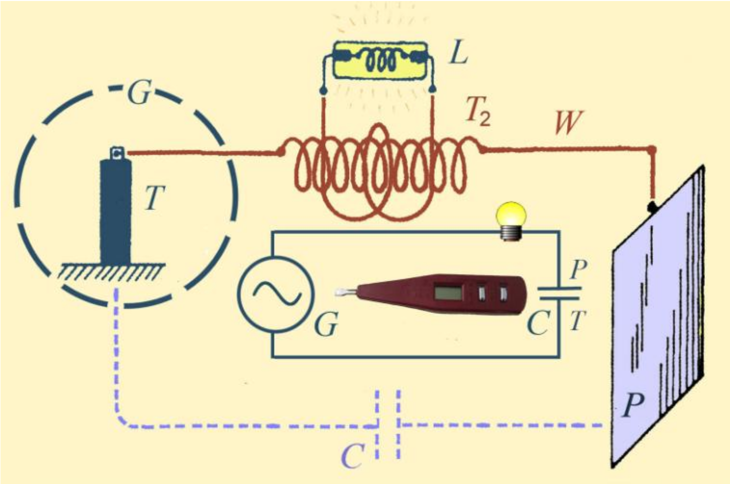

Fig. 3. Single-wire electric energy transmission.

The larger the plate, the brighter the lamp *L* shines. The higher the frequency ω of the alternative current produced by the generator *G*, the higher the current in the circuit. A twofold increase in the plate area leads in a twofold increase in the current strength. Reducing the frequency in the current by half leads to a decrease in the current by half. Everything goes to the fact that we are dealing with capacitive resistance, the value of which is inversely proportional to capacitance *C* and inversely proportional to frequency: $Z_C=1/(\omega C)$ [12].

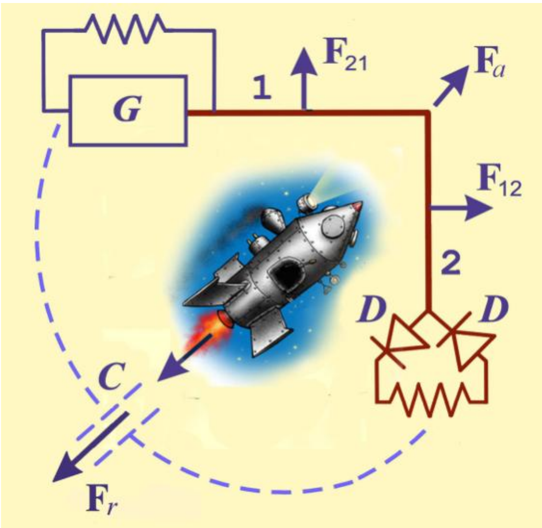

Fig.4. Reactive motion of unclosed electric current.

In fact, this phenomenon is well known. Sensors are known and used to determine if there is a voltage in a net work without measuring the voltage drop across a particular load. It is enough to touch the current-carried element with a single contact of the sensor to solve this every day problem. Of course, the sensor design is significantly different from that shown in Fig. 3. Instead of a plate, a simple voltage multiplier is used, which can be made of several diodes. For the single-wire transmission of electric energy, this allows to use of a resonant mode characterizing very large current in the circuit [13]. The self-force also becomes very large if the current-carrying wire is bent at a certain angle (Fig. 4). Another way to increase the self-force is take into account that its value depends only on the relative dimensions of an unclosed conductor and is proportional to the square of the current in the circuit. This means that one can create large net force acting on large number of very small unclosed conductor with an alternative electric current. Moreover, the thinner the conductor, the greater this force [14].

It is noteworthy that this so far been said only about the self-force with which unclosed acts on itself. One should not forget about the force of action that also acts on an unclosed conductor and which also make it move. Displacement current is not an electric current of moving charges, but a time-varying electric field [15]. The varying electric field and the associated displacement current generate an oscillating magnetic field. Therefore the displacement can produce the force of action $\mathbf{F}_a$ exerted by an unclosed conductor. This force is no different from the Ampere's force. The whole question is now different: does the magnetic field act on displacement current, creating a reaction force $\mathbf{F}_r$? If not, then this breaks the law of conservation of momentum, since at least the self-force $\mathbf{F}_{21}+\mathbf{F}_{12}$ for an unclosed bent conductor is not equal to zero.

IV. Conclusion

A rocket moves by repelling the gases emitted from the nozzle. An unclosed conductor with an alternative electric current can move by repelling, formally speaking, from the displacement current but essentially from the electromagnetic field created by the unclosed conductor. Like a rocket, a system with unclosed electric currents does not create something like gravity, but it can compensate for it. It is not fields that interact, but bodies. Any mention of electrogravity [16] is therefore inappropriate. Another thing is when it comes to compensating for gravitational attraction. It's in vain that NASA gave up the breakthrough propulsion from physics [1]. It turns out there is a solution to this problem. The history of natural science is to remember how a seemingly weak phenomenon became the basis for a significant technical breakthrough.

The mention of the EM-drive system is made out of necessity. In a sense, the EM-drive is reactive, it also repels from field, which are the microwaves created by a magnetron. The force with which the wave acts on metal in some cases can be extremely small. Of course, there is no self-action in this system.

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